

REMARKS

This application has been reviewed in light of the Office Action mailed April 26, 2006.

Reconsideration of this application in view of the below remarks is respectfully requested.

Claims 1 – 13 are pending in the application with Claims 1, 6, 11, 12 and 13 being in independent form. By the present amendment, Claim 14 is newly added; Claims 1, 6, 11, 12 and 13 are amended; and Claims 4, 5, 9 and 10 are canceled. No new subject matter is introduced into the disclosure by way of the present amendment.

I. Objection to Claims 5 and 10

Claims 5 and 10 are objected to for allegedly being in improper dependent form. In the present amendment, Claims 5 and 10 have been canceled, thus rendering the objection moot with respect to these claims.

II. Rejection of Claim 1 Under 35 U.S.C. § 101

Claim 1 is rejected under 35 U.S.C. § 101 as allegedly reciting limitations that result in an improper definition of a process by failing to set forth any steps involved in the process. In response, Claim 1 has been amended such that the limitation regarding "...a similarity search step of using..." has been deleted. Therefore, the rejection to Claim 1 is believed to have been adequately obviated. Accordingly, Applicants respectfully request withdrawal of the rejection with respect to Claim 1 under 35 U.S.C. § 101.

III. Rejection of Claim 1 – 5 Under 35 U.S.C. § 112, First and Second Paragraphs

Claims 1 – 5 are rejected under 35 U.S.C. § 112, first paragraph for allegedly failing to comply with the enablement requirement; and under 35 U.S.C. § 112, second paragraph for

allegedly being indefinite for failing to particularly point out and distinctly claim that which the Applicants regard as the invention.

Specifically, the rejections are based on the limitations of: "...a first feature value extraction step..." and "...a second feature value extraction step..." Claims 2 – 5 are rejected for being dependent at least from a rejected base claim.

In response, Claim 1 has been amended such that the limitations of: "...a first feature value extraction step..." and "...a second feature value extraction step..." are no longer recited in the claim. Therefore, the rejection to Claim 1 is believed to have been adequately obviated. Accordingly, Applicants respectfully request withdrawal of the rejections with respect to Claims 1 – 5 under 35 U.S.C. § 112, first and second paragraphs.

IV. Rejection of Claims 1 – 4, 6 – 9 and 11 – 13 Under 35 U.S.C. § 102(b)

Claims 1 – 4, 6 – 9 and 11 – 13 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by U.S. Publication No. 2001/20946 issued to Kawakami et al. Claims 4 and 9 have been canceled by way of the present amendment, thus rendering the rejection moot with respect to these claims.

Claim 1 has been amended to recite the limitations of: "...a search object image production step of producing a plurality of two-dimensional images obtained by observing the specific three-dimensional model as an object of search from points of view different from one another based on the specific three-dimensional model; a search object storage step for storing three-dimensional model information regarding the specific three-dimensional model and two-dimensional image information regarding the plurality of two-dimensional images; a search key input step of inputting a two-dimensional image as a search key; a comparison step for

comparing a similarity of the two-dimensional image input as the search key with similarities of the plurality of two-dimensional images for which the two-dimensional image information is stored in the search object storage step; a determination step for determining similarities of the two-dimensional images based on a result of comparison in the comparison step; and a three-dimensional model specification step for specifying a three-dimensional model associated with a two-dimensional image whose similarity is determined to be high in the determination step.”

Amended Claims 6 and 11 – 13 recite similar limitations.

The present invention relates to a three-dimensional model search method and apparatus, which are effective in, e.g., making a search for an interior item such as a chair as illustrated in FIG. 3. In an example referred to in the above figure, the user performs a search operation for checking whether or not a desired interior item is present in a large number of interior items such as a desk, a chair and a bed, which are registered as three-dimensional models in advance in a database.

In a conventional method, if the user intends to search for a chair having curved legs, he or she must extract all the data items stored in the database one by one, and check whether each of the data items corresponds to the above chair on a display, or must input three-dimensional information regarding the chair as computer data, and search for a data item corresponding to the chair. However, in the case where the user checks whether the data items correspond to the chair one by one on the display, if the number of data items is large, checking is troublesome. Also, it is very troublesome to input three-dimensional information regarding the chair.

The present invention provides a significant improvement over the conventional method described above. Specifically, in the present invention, when, for example, an interior item such

as a chair is newly recorded and registered in the database, two-dimensional images of the chair as viewed from different points of view are automatically produced and recorded as data along with three-dimensional information regarding the chair in the database. Then, for example, in the case of searching for a chair having curved legs, the user has only to input two-dimensional image information regarding the chair having the curved legs. The two-dimensional image information may be input by using, for instance, a mouse or a stylus (tablet pen) on a computer or may be done as two-dimensional image information obtained by photographing of a digital camera or the like. Then, the input two-dimensional image information, which serves as a search key, is compared with each of a plurality of two-dimensional image information registered in advance in the database, and the similarity of each of the two-dimensional image information is determined. This comparison is a simple comparison in similarity between the two-dimensional image input and each of the two-dimensional images, that is, the correlation between image data items. Thus, the computational complexity can be greatly decreased, as compared with the comparison between three-dimensional image data items.

In such a manner, the present invention can greatly improve the search operation, and has a significant advantage over the conventional method in which inputting of three-dimensional information, which is complicated, needs to be performed in order to search for and extract desired three-dimensional information regarding, e.g., a chair.

Also, when the search operation is actually performed in the invention, as stated above, the comparison and calculation operations are all performed based on two-dimensional image information, and can thus be done at a considerably higher speed, thus greatly improving the convenience of the user.

Kawakami relates to an image identification device for identifying the person by, e.g., his or her face. However, the system of Kawakami is intended to search for one of three-dimensional shape models, which corresponds to an input two-dimensional image, on the premise that such a three-dimensional mode is present. Thus, it is indispensable for the system of Kawakami that the input two-dimensional image is projected on the three-dimensional model side. This is disclosed as a flowchart in FIG. 5.

According to the flowchart of FIG. 5, first a pose transform, which corresponds to rotational transform expressed by 3 degrees of freedom in roll angle, pitch angle and yaw angle, is carried out, and a two-dimensional image input as a key is projected on a three-dimensional image mode subjected to the pose transform. Then, the degree of correspondence between the two-dimensional image and the three-dimensional image model is determined, and the above series of processes is repeated until an error indicated by the result of the above determination is corrected. In the system of Kawakami, it is ensured that the correspondence is accurate. However, a very complex computation is repeated a large number of times, thus requiring an enormous amounts of calculation time.

In the present invention, although a plurality of three-dimensional image models are stored as data of search objects, the search operation is not performed on the premise that a three-dimensional image model is present which completely corresponds to a two-dimensional image input as a key. In the invention, when the three-dimensional image modes are input and registered, a plurality of two-dimensional images are produced and stored as data on the basis of the three-dimensional image models, and an image, i.e., an object to be compared with the two-dimensional image input as the key is also two-dimensional. This two-dimensional image

representation of the object is not subjected to such rotational transform or projection as disclosed in Kawakami; that is, it is subjected only to the above comparison and determination operation regarding the similarity.

Since the comparison operation is applied to two-dimensional images, it can be much more easily performed at a high speed, and the calculation and determination do not need to be repeated a larger number of times until the error is corrected, unlike Kawakami. The present invention is intended to perform the search operation at a high speed, and is therefore entirely different in technical concept from Kawakami.

It is well-settled by the Courts that “[A]nticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim.” Lindemann Maschinenfabrik GMBH v. American Hoist and Derrick Company, et al., 730 F.2d 1452, 221 USPQ 481 (Fed. Cir., 1984).

Therefore, as demonstrated above, because Kawakami does not disclose each and every element recited in the present claims, Applicant respectfully submits that the rejection has been obviated. Accordingly, Applicants respectfully request withdrawal of the rejection with respect to Claims 1 – 3, 6 – 8 and 11 – 13 under 35 U.S.C. § 102(b).

V. Newly Added Claim 14


By the present amendment Claim 14 has been newly submitted. Support for the limitations recited therein can be found in the specification as originally filed. In particular, Claim 14 is directed towards subject matter illustrated in FIG. 2, step 108; and disclosed in detail on pages 15 and 16 of the specification. Accordingly, no new subject matter is introduced by way of newly added Claim 14.

CONCLUSIONS

In view of the foregoing amendments and remarks, it is respectfully submitted that all claims presently pending in the application, namely, Claims 1 – 3, 6 – 8 and 11 – 14 are believed to be in condition for allowance and patentably distinguishable over the art of record.

If the Examiner should have any questions concerning this communication or feels that an interview would be helpful, the Examiner is requested to call Applicant's undersigned attorney at the number indicated below.

Respectfully submitted,



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